A CARRIAGE FOR A ROLLER SKATE

The present invention relates generally to a carriage for a roller skate and to a roller skate incorporating such a carriage.

As used in this specification the term "roller skate" will be understood not only to refer to a fitting adapted to be worn on the foot of a user, and having a plurality of wheels or rollers by which the wearer can roll or "skate" over the ground, but also to a skate having a platform mounted on a plurality of wheels and commonly referred to as a skateboard. The term "skate" will hereinafter be used to refer to both boot type and board type skates. Two main roller skate configurations are known, namely a traditional roller skate comprising two pairs of wheels in fore and aft pairs with each pair being mounted for rotation about a common axis, often on a common axle, on a skate body or board: indeed skateboards almost all have such a wheel configuration for reasons of stability. Each pair of wheels is referred to as a "truck" and such skates will therefore hereinafter be referred to as "truck" skates. More recently skates having a plurality of wheels in a single row individually mounted on a support so as to be in-line with one another have been introduced. Such skates provide rolling contact with the ground similar in many respects to the sliding contact of an ice skate. The

carriage of such a skate is usually surmounted by a boot with secure ankle straps by which the user's foot can effectively be connected to the wheels. Having a plurality of wheels in an in-line configuration gives such skates an appearance resembling that of an ice skate with the wheels taking the place of an ice skate blade and, for that reason, such skates are often known as "roller blades" and hereinafter will be referred to as "blade" type skates.

Whatever the wheel configuration all roller skates need smooth surfaces on which to roll in order to perform properly because the wheels or rollers are of relatively small diameter which cannot surmount large obstructions.

Roller skates cannot be used to roll over rough surfaces such as cobble stones and even coarse tarmac presents problems because the vibration caused thereby is disagreeable to the user. For this reason such irregular surfaces are avoided. Skate manufacturers try to overcome the disadvantages of running over irregular surfaces as much as possible. Truck type skates frequently have resilient blocks between the individual trucks and the carriage or plate by which they are secured to a wearer's shoe, or a boot incorporated in the skate, such resilient blocks acting in compression or in shear to absorb a minor part of the roughness of irregular surfaces. Further attempts to absorb such

irregularities and made in the choice of material used for the wheels themselves. Commonly the outer peripheral portion of the wheels is made from an elastomeric material, especially polyurethane, which has a good resistance to abrasion and wear whilst at the same time providing a degree of resilience which helps to absorb minor imperfections in the surface.

All these attempts, however, provide only a very limited capability to absorb irregularity or roughness in the surface over which the skate passes and none have successfully managed to provide means by which large irregularities can be absorbed. In this context "large" in terms of the irregularity of a surface may mean surface asperities of the order of several centimetres, such as may be experienced on cobbled surfaces or very coarse tarmac, paving slabs, gravel or the like.

The present invention seeks to overcome the disadvantages of prior art roller skates by providing a roller skate carriage having means by which relatively large (as herein defined) excursions of the wheels can be made independently with respect to the roller skate carriage whereby to allow the carriage itself to move relatively smoothly over the surface.

According to one aspect of the present invention, therefore, there is provided a carriage for a roller

skate in which each wheel is independently suspended on the carriage by a resilient suspension which includes means for constraining the wheel to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension, wherein the said path includes a component of motion directed towards the rear of the carriage with respect to the direction of travel thereof.

In this context a resilient suspension is to be understood to include any means by which a wheel may be secured to a roller skate carriage in such a way that movements of the wheel towards or away from the carriage in a range of directions generally transverse the direction of movement of the roller skate carriage in use.

In a preferred embodiment of the invention a roller skate carriage as herein above defined is provided with a resilient suspension for each wheel including means for constraining the wheel to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension. Such constraining means may, for example, comprise one or more trailing arms for each wheel. The position of a trailing arm is of particular interest since it can be arranged, with such a structure, that the wheel encountering an obstruction may move rearwardly as well as upwardly in relation to a roller

skate carriage in a normal upright orientation of use, in order to accommodate the impact with the obstruction. In this way each individual wheel may roll over an obstruction without causing the other wheels to be disturbed from their normal position and without causing the carriage to move from the horizontal plane in which it is travelling.

The present invention is equally applicable to blade type roller skates as to truck type roller skates and the wheels of a roller skate carriage formed as an embodiment of the present invention may be arranged in line with one another along the body of the carriage in a single row, or my be arranged in coaxial pairs on the body of the carriage.

The suspension for each wheel may include a resilient member acting both to exert a resilient biasing force urging the wheel towards one end of its path of suspended travel with respect to the carriage and as a wheel guide member at least partly defining the path travel of the wheel. Such resilient member may be a leaf spring. Alternatively, the resilient action of the suspension may be exerted by a compression spring and in one embodiment the compression spring is a coil spring which may be made of metal or plastics. Alternatively, a compression spring formed as a chamber of compressible gas having a piston sealingly displaceable within it may act as the

resilient member of the suspension.

Other forms of resilient member for the suspension may include torsion springs which, in particular, may be a coil spring acting in torsion.

If leaf springs are employed these may be elliptical or semi-elliptical leaf springs or a generally U-shape leaf secured by one limb to the carriage and carrying the wheel on another limb thereof.

Whatever the form of the resilient member of the suspension it is envisaged that the resilient suspension of each wheel will be substantially undamped although frictional or fluid damping of the motion of a spring member (whether it is a mechanical or a compressed gas spring) may be provided without departing from the scope of the present invention.

Again, regardless of the form of the resilient member of the suspension, embodiments of the present invention may be formed in which the path of movement of a wheel upon displacement of the suspension is non-linear. Such non-linearity may include a variation in the direction of travel of a wheel with variation in the magnitude of the excursion from a static load position.

In embodiments of the invention in which the path of the

wheels upon displacement of the suspension is constrained by a trailing arm, the wheels may be carried by respective pivoted trailing arms pivotally mounted for rotation about respective axes substantially parallel to the axis of rotation of the wheel carried thereby.

Each said pivoted trailing arm may house a respective coil spring urging the arm to turn in a first direction about its pivot axis with respect to the carriage body.

For practical convenience it is preferred that the resilient suspension force acting on each wheel is independently adjustable by respective adjustment means. It is always possible, of course, for the wheels to be linked together so that the individual independent suspensions are operated together.

The adjustment of the resilient suspension force may be effected by adjustment of the angular position of a locating member held in place by frictional engagement with a fixed part of the carriage or a member carried thereby.

At the other end of its range of movement from the full-deflection position of the resilient suspension member there may be provided abutment stops on the body of the carriage, engaged by a moveable part of the suspension whereby to extend the maximum extension travel of a wheel

suspension.

Such abutment stops are preferably adjustable whereby to adjust the said maximum extension position of a wheel.

Whatever the form of the skate carriage, that is whether it is a blade type or a truck type roller skate, the body of the carriage may include or comprise at least one elongate plate-like member on which a plurality of individual wheel suspensions are carried. A single such plate-like member may be provided for a blade type roller skate in which the wheels are mounted in line with one another although two such plates may be provided with each wheel having two connecting linkages to the wheel axle. If this is the case one or both such linkages may include resilient biasing means.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a roller skate carriage formed as a first embodiment of the present invention;

Figure 2 is a schematic exploded perspective view of a suspension assembly for one wheel of the embodiment of Figure 1;

Figure 3 is a front view from one end of the roller skate carriage of Figure 1;

Figure 4 is a similar front view of a second embodiment of the present invention;

Figure 5 is an exploded perspective view of a suspension assembly suitable for use in the embodiment of Figure 4; and

Figure 6 is a schematic view from one side of the suspension assembly of Figure 5 showing two ends of its range of movement.

Referring first to Figure 1 there is shown a roller skate carriage of the "blade" type generally indicated 11 suitable for attachment to a boot (illustrated schematically, but not referenced) of a wearer.

The body of the carriage 11 comprises an L-section main member generally indicated 12 having, in the orientation of use illustrated in Figure 1, an horizontal flange 13 and a vertical flange 14. The horizontal flange 13 is secured by bolts (not shown) to intermediate plates 15, 16 in turn secured to the boot (not shown) of the roller skate, represented by the single line 17 in Figure 1.

Suspended from the vertical flange 14 of the carriage body 12 are four wheels 18, 19, 20, 21 which are all identical to one another: the wheels 18-21 are carried on respective transverse axles parallel to one another and perpendicular to the plane of the flange 14 such that the wheels 18-21 are in line for common rolling motion.

The suspension by which each wheel 18-21 is suspended from the carriage 12 is identical for each wheel, and therefore only one such suspension, namely that for the wheel 18, will be described in detail with reference to Figures 1, 2 and 3.

The wheel 18 is of a known type for unsprung roller blade type roller skates having a polyurethane outer perimetral "torus" and a central hub incorporating bearings which can be mounted, as seen in Figure 2, on a fixed axle 22 having a spacer sleeve 23 of larger diameter defining with the axle 22 an annular shoulder 24. A free end of the axle 22 has an axial threaded hole 25 to receive a screw 26 by which the wheel 18 is secured to the axle 22 with its bearing (not shown) abutting against the shoulder 24. The axle 22 is fixedly secured by means (not shown) in a hole in an arm 26 which is pivotally mounted on the flange 14 in a manner which will be described hereinafter.

The arm 26 is a lobe of a body 27 of generally circular shape having an annular channel 28 in one face 29 thereof surrounding a central cylindrical boss 30 having a through hole 31 passing through it. The annular channel 28 has a bottom wall 32 formed as a web of the body 27. A hole 33 is formed in the bottom wall 32 for purposes which will be described in more detail below. Housed in the central cylindrical opening 31 in the boss 30 is a

generally cylindrical mount 34 having a terminal radial flange 35 at one end and a threaded axial hole 36 at the other. The length of the cylindrical body portion of the mount 34 is slightly greater than the thickness of the body 27 such that when introduced into the hole 31 an end face 360 of the mount 34, bearing the threaded hole 36, projects a few thousandths of a millimetre beyond the end face 36 of the cylindrical boss 30.

A coiled helical wire spring 37 of two complete turns is housed in the channel 28. The ends of the coil spring 37 are each bent axially to form engagement pins 38, 39 the former of which engages in the hole 33 in the bottom of the channel 28. The other engagement pin engages in a hole 40 of a cover disc 41 which, when the unit is assembled as illustrated in Figure 3, lies between the body 27 and the vertical flange 14 of the carriage body. The disc 41 has a central hole 42 through which passes a screw 43 which is threaded into the threaded hole 36 of the mount 34. In Figure 2 the flange 14 is represented by the small section thereof illustrated only for clarity. As the screw 43 is tightened it draws the cylindrical mount 34 through the cylindrical opening 31 of the boss 30 to press the cover disc 41 tightly against the flange 14. Because the cylindrical body 34 is longer than the thickness of the body 27 this latter is free to rotate on the mount 34 whereas the cover disc 41 is clamped securely by friction against the flange 14. The spring

37 can be pre-tensioned by appropriately orientating the disc 41 which, as can be seen in Figure 3, projects slightly below the lower edge of the flange 14 for this purpose. Once this adjustment has been made, however, it is possible to effect readjustment only with difficulty, by first removing the wheel 18.

The orientation of the body 27 in relation to the vertical about an axis passing through the centre of the cylindrical boss 30, can be varied by adjusting a threaded stop screw 44 which passes through a threaded opening in a lug 45 on the diametrically opposite part of the body 27 from the arm 26 which carries the wheel 18. The screw 44 has an enlarged head 46 which can engage a resilient pad 47 carried on an abutment block 48 secured to the flange 14. As illustrated in Figure 1 the arm 26 is orientated such that the line joining the axis of the wheel spindle 22 and the axis about which the body 27 rotates is substantially vertical; this is not necessarily a working position but has been shown for clarity of illustration. This can be adjusted to a rearward inclination by turning the head 46 of the screw 44 by means of a suitable open key.

The embodiment of Figures 1 to 3, as is most clearly seen from Figure 3, is asymmetrical although it is anticipated that the structural components will be easily formed such as to be adequately strong to resist the forces exerted

on them in use. This is sufficient for general skating purposes. If, for special purposes greater strength is required a configuration such as that shown in Figure 4 may be employed in which the wheel 18 is carried on a spindle 22 (provided within spacers 230) which projects to both sides of the wheel and is carried on respective arms 26, 26' pivotally carried on respective flanges 47, 48 of respective T-section carriers 49, 50 the upper cross arms 51, 52 of which are secured to a base plate 53 for attachment to a boot 54. The wheel mounting configuration of Figure 4 offers greater symmetry to resist stresses exerted on the axles 22 by the wheel 18 at the expense of additional material and therefore greater weight.

Figure 5 is an exploded view illustrating an alternative structure for the arm 26 which is employed in the embodiment of Figure 4. It has the advantage over the support arm structure of Figure 2 that the biasing spring force can be adjusted from an external point by a user thereby enabling the user to vary the spring forces in play depending on the intended use and/or the user's weight.

Referring now to Figure 5 those components which are substantially the same as, or fulfil the same function as, corresponding components in the support arm of Figure 2 have been identified with the same reference numerals.

Thus, the wheel 18 has a spindle 22 carried in a hole 55 formed in an arm 26 of a suspension body 29. A grub screw 56 engaged in a threaded hole at the end of the arm 26 which is not visible in Figure 5 locates the spindle 22 and secures it in position. A collar or spacer sleeve 220 spaces the wheel 18 from the arm 26.

In this embodiment the body 29 is carried on the flange 14 (schematically as shown in Figure 5) in the opposite orientation from that in which the corresponding body is located on the flange 14 in Figure 2. In other words, the channel 28 of the body 29 faces away from rather than towards the flange 14. In this embodiment the hole 36 through the cylindrical mount 34 is plain rather than threaded so that the screw 43 can pass through it without being threaded into it. Upon assembly, therefore, the screw 43 is passed through a washer 58 and then through the flange 14 and held in position while the mount 34 is positioned over it. The mount 34 is then introduced into the opening 31 in the boss 30 by fitting the arm 29 over the mount 34 and the spring 36 is introduced into the channel 28 with the end pin 38 located in the hole 33. The cover washer 41 is then fitted over the screw 43 with its hole 40 engaged on the pin 39 of the coil spring 36, and a nut 57 is screwed onto the screw 43. Because the cylindrical mount 34 is longer than the thickness of the body 29 the plate 41 is drawn onto the end face 34a of the mount 34 and is clamped fixedly in position in

relation to the flange 14. The body 29, on the other hand, can rotate about the axis defined by the screw 43 with respect to the flange 14. Such movement coils or uncoils the spring 36 and an appropriate pretension can be applied by slackening the nut 57, turning the disk 41 clockwise or anticlockwise as appropriate, holding the disk 41 in the adjusted position and retightening the nut 57 to clamp it tightly against the end face 34a of the boss 34.

The body 29 also has an abutment 45 which, like the embodiment of Figure 2 is provided with an adjusting screw which, however, is not shown in Figure 5 for simplicity.

Referring now to Figure 6 it will be seen that the arm 26 can be set to an inclined position (that is a position in which the line joining the pivot axis of the body 29 defined by the screw 43, and the axis about which the wheel 18 rotates, defined by the hole 55) is inclined to the vertical by a small angle such that a downward load on the boot (or an upward load from an obstruction on the ground as the skate rolls over it) can cause the arm 26 to rotate about the pivot axis from the position shown is solid outline in Figure 6 to the position shown in broken outline in this figure. The direction of advance of the roller skate is represented by the arrow A. Fine adjustments to the inclination of the arm 26 can be made

by adjusting the screw 44 the end of which engages against the pad 47 of the abutment block 48.

In use of the roller skate of the invention, therefore, as the user passes over obstructions the impact can be absorbed by the rocking of the arm 26 about its pivot axis. Moreover, by suitable selection of the spring rates and their adjustment, a skater can arrange that when pressing downwardly to push off during the skating action, all the wheels can be depressed concurrently so that the energy stored in the springs by this action can be utilised upon extension of the springs to enhance the force exerted by the skater and improve his performance.

It is to be understood that the embodiments described ~~alone~~ above are susceptible of modification and variation without departing from the ambit of the invention as defined in the following claims. For example, the coil springs could be replaced by springs of other form, such as torsion or shear springs for example those known as "silentbloc" springs comprising annular bushes bonded to the radially outer and inner surfaces of two relatively rotatable components such as the arm 26 and the flange 14.